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Evaluation of User Interface: A Case of Iranian Disability Websites

Abstract

Improving the user interface of websites for people with disabilities can increase the use of websites, which helps promote the quality of life of disabled people. The aim of this study was to explore and evaluate user interface design criteria of Iranian websites for those with physical-motor disabilities. Heuristic evaluation was used in the present study. The user interface criteria of websites for the disabled were extracted from previous studies and a self-made log list was then used to assess the criteria. Six out of forty-five websites in the field of the disabled were selected by purposive sampling and surveyed. Ten main criteria and 76 subcomponents were identified for websites. Display design and search criteria were the most and least important for experts, respectively. Assessments showed that all ten criteria were met to a desired level (average of 62.66%) on websites. Consistency and search criteria had the highest and lowest compliance with criteria with 88.25 and 53.47%, respectively. The website of Irantavana and Iranian Disabled Community received the highest and lowest scores in user interface, respectively. This study can be used as a suitable guide for more efficient design of websites for the disabled.

Keywords: Consistency, Disability, Navigation, Physical-motor, Rehabilitation, User Interface, Website, Website design

Introduction

Disability is a bitter reality. According to International Classification of Functioning, Disability and Health (ICF), disability involves three main dimensions: 1) Disruption of the functioning or structure of the body or mental ability of a person (such as a disability or memory loss); 2) Restriction of activities (like visual or problem-solving difficulties), and 3) Limitation of participation in normal daily activities (e.g. work, contribution to social and recreational activities, access to health care and prevention services)(WHO, 2001). Therefore, disability can be considered a complex phenomenon and a combination of physical problems and social phenomena(Maleki & Kazemi, 2016). According to WHO, approximately 15% of population in the world has a type of disability(Chu et al., 2016). In fact, disability is a common phenomenon experienced by almost all people temporarily or permanently at some point in their life(Soltani, Khosravi, et al., 2015). In 2013, WHO reported that nearly 80% of those with disabilities live in developing countries(Chu et al., 2016). As a developing country, Iran is not free from this shortcoming, and based on statistics, 1-4% of the general population of Iran includes disabled people with increasing prevalence(Soltani, Khosravi, et al., 2015).

From the perspective of rehabilitation, physical-motor disability is a type of disability(Davarmnesh & BaratiSade, 2007). A person with physical-motor disability is one who, for whatever reason, has weakness, disorder, or inability in the motor system limiting one or more main activities in life, which necessitates assistive devices(Dermani, 2017; Pourhossein Hendabad et al., 2017). Therefore, the existence of such limitations can overshadow the quality of life of individuals and those around them in all aspects.

On the one hand, people with physical-motor disability have several needs, including education and information(Sharifian-Sani et al., 2006). On the other hand, the Internet has nowadays

transformed the information transfer cycle and is considered an important platform in this field(Dubowicz & Schulz, 2015). The rapid growth and popularity of the Internet have made it a highly popular tool for information retrieval, especially in the field of health care(Norman, 2011). According to studies, the Internet is the main source of information for people seeking health information(Dutta-Bergman, 2004), and in this way, they feel good in searching for information(Fox, 2006). Among the various types of information on the Internet, websites are important sources for searching health information and referring to content(Hamzehei et al., 2018; Kaushik, 2015). A website is a collection of related web pages, images, videos or other digital assets that usually had a specific aim, such as educational, news, scientific, and so on(Rahman & Batcha, 2020). Websites provide 24/7, free, easy and up-to-date access to information to their users in real time.

"Accessibility for all people regardless of disability" is the global goal of World Wide Web(Kennedy et al., 2011). Therefore, to provide information services, the Internet and its websites must cover all layers of the society, including the disabled community. Websites can influence the quality of life of people with disabilities by facilitating access to and use of their content. To this end, the role of the user interface is irreplaceable(Lanyi et al., 2012). The user interface is the bridge between human and the web environment(Saljoughi et al., 2016) and determines the user's reaction, in a way that it can affect a person's decision to continue using, revisiting or leaving the website. Consequently, it is not surprising that the user interface has been mentioned as the most important factor in determining the success and failure of databases(Large & Tedd, 2001).

The importance of the user interface has led researchers to study it in technological environments. For example, Nandigam *et al.* in a study examined the mobile user interface among patients with

traumatic brain injury (Nandigam et al., 2010). Their results suggested several criteria for the design of user interface as follows: 1) Soft finger touch; 2) Large buttons; 3) Icons supported by titles and 4) A single-level menu structure. Kennedy *et al.* conducted a study aimed at contributing to the social participation of people with intellectual disabilities in World Wide Web. The results of their study revealed that web pages will be more accessible to people with intellectual disabilities if they use images related to the main content, simple navigation, plain text and short sentences, use of voice to recall pages, inclusion of videos, animation and audio (Kennedy et al., 2011). The study of Williams and Henning showed how web design can be optimized for people with learning disabilities. (Williams & Hennig, 2015). Borblik *et al.* examined the user interface of mobile apps for people with intellectual or developmental disabilities, suggesting requirements for navigation and graphic design sections as well as app texts (Borblik et al., 2015).

Moreover, Sedighi *et al.* in a research examined the compliance of user interface evaluation criteria in digital libraries for the blind and deaf worldwide, which showed that the "user interface language" and "user control" criteria had the highest and lowest level of compliance with 97.92 and 9.67%, respectively (Sedighi et al., 2016). The results of Saljoughi *et al.* also showed that the user interface in websites under study is somewhat desirable but that some criteria need more attention. The relevant literature shows that attention to the user interface of websites/applications is important to researchers in the field of health (Saljoughi et al., 2016).

Given the need to be aware of the demands of people with disabilities (Soltani, Hafshejani, et al., 2015) and also the role of user interface in their use of websites as a main channel for acquiring information, this study can identify the weak points of the user interface, address the shortcomings of websites for people with disabilities for ease of access of websites for them.

Objectives

The main aim of this study was to explore and evaluate user interface design criteria of websites for those with physical-motor disabilities. So this case study was conducted in Iran with the following objectives:

- a) To extract the required criteria required in the design of user interfaces of websites for the disabled;
- b) To determine the status of the sites meant for the disabled in the country based on the criteria of the user interface and the status of each criterion,
- c) To identify the most important concerns of experts about user interface criteria.

Methodology

This applied and descriptive study was conducted using heuristic revelation method. Literature review(Hariri & Norouzi, 2011; M Hassanzadeh & Eskandari, 2013; Mohammad Hassanzadeh & Sohrabzadeh, 2013; Mehrad & Zahedi, 2007; Yaghub Norouzi, 2010; Y. Norouzi & Motazhari, 2015) were used to prepare a checklist. The research population included websites related to the disabled. Google was the most widely used search engine to identify websites. Thus, the "Website for the Disabled", "Website and the Disabled" keywords were searched in Google and the names of websites were selected from among the first page results because studies show that on average 91% of people only look at the first page of search engine results(Smeeton et al., 2018). A total of 45 URLs related to the field of the disabled were identified, of which 31 were related to Welfare Organization of each province and 14 other websites were concerned with various areas, including sports, art, and so on. The list of websites was reviewed by experts and finally six websites were

selected as the statistical sample that contained at least one third of the components identified in the research log list (Table 1).

Table 1. Names of websites under study

Title of website	URL
State Welfare Organization of Iran	http://www.behzisti.ir/
Shamdani	http://shamdani.com/
Iranian Disabled Community	http://iransdp.com/
Disability Data Bank	http://www.datadisability.com/
Irantavana	http://www.irantavana.com/
Office of Disabled's Culture	http://www.handicapcenter.com/

Data collection was done using direct observation based on a researcher-made log list. There were two scales of there is and there is not (yes and no) in the list. The scoring method was used because a number of information components may not have complied with the criterion to the same extent. Thus, scores of 0.75, 0.50 and 0.25 were considered for desirable, medium and weak equivalents, respectively. After reviewing the records, a log list consisting of 10 main criteria (search, consistency, guidance, information display, page design, navigation, user control, user interface language, error correction and ease of use) were extracted in 75 components. Furthermore, the importance of the ten criteria was ranked by experts. The validity of the log list was confirmed by the statements of several knowledge and information science experts, as well as two computer scientists and a disability aid assistant. Data were analyzed using descriptive statistical methods, Kolmogorov-Smirnov, Shapiro-Wilk and Wilcoxon tests using SPSS 25 software.

Results

Our findings led to the extraction of 10 general criteria in 75 components to evaluate the user interface on websites related to the disabled. Examining the level of compliance with the ten criteria of user interface on websites of the disabled showed that all the criteria were in a generally

favorable condition and met on average 62.66% of the criteria. A more detailed review of the evaluation of user interface criteria revealed that search, guidance, information display, display design and user control were moderately observed and that consistency, strategy, user interface language, error correction, and ease of use were optimally observed. Moreover, a more detailed evaluation of the user interface criteria showed that search, guidance, information display, display design and user control were moderately observed and that consistency, strategy, user interface language, error correction, and ease of use were observed to the desired level. Consistency and search with average scores of 88.24 and 47.52 had the highest and lowest rank among criteria, respectively. The findings of this study also examined the total score of compliance with the ten criteria in each of the websites meant for the disabled. Accordingly, the websites of Irantavana and Iranspd with 68.89 and 57 obtained the highest and lowest scores, respectively (Table 2).

Table 2. The average of top ten criteria of websites by each website criterion

Criteria	IDC	Shamdani	DDB	ODC	SWO	Irantavana	Total Average
Consistency	85.36	91.73	81.67	90.12	95.00	85.60	88.25
Ease of use	80.00	86.67	84.76	80.00	84.29	84.76	83.41
Navigation	74.64	62.50	69.44	76.43	67.96	86.07	72.87
Language	66.19	78.10	74.29	68.10	60.95	83.33	71.83
Error correction	61.07	53.21	57.14	73.57	52.50	64.29	60/30
Guidance	45.71	55.71	48.93	51.79	54.29	58.21	52.44
User control	44.49	52.65	47.76	48.57	50.20	62.45	51.02
Display design	36.57	46.48	45.14	52.00	60.24	57.71	49.69
Display information	45.36	43.21	43.21	47.76	56.07	59.64	49.23
Searching	30.57	45.43	67.14	40.86	54.29	46.86	47.53
Total	57.00	61.57	61.97	62.93	63.58	68.89	62.66

Note: IDC= Iranian Disabled Community; DDB= Disability Data Bank; ODC= Office of Disabled's Culture; SWO= State Welfare Organization of Iran

In this study, the scores of each component in the ten criteria were extracted and plotted (Fig. 1). Based on the following Figure, some components such as coordination and communication between colors, voice recording, frequently asked questions, etc. were lower than average (mean 50% of the score), which are shown in black. Also, in terms of the importance of criteria, based on

expert opinion, display design and search criteria had the highest and lowest average, respectively (Table 3).

Table 3. The importance of the ten criteria from the viewpoint of experts

Rank	Criteria	Average (Percent)
1	Display design	4/19(83/85)
2	Navigation	4/18(83/61)
3	Error correction	4/12(82/50)
4	Ease of use	4/09(81/85)
5	Language	3/94(78/88)
6	Guidance	3/91(78/33)
7	Display information	3/84(76/94)
8	Consistency	3/83(76/66)
9	User control	3/76(75/23)
10	Searching	3/42(68/44)

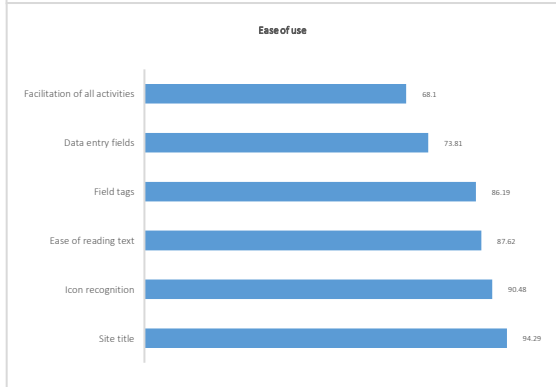
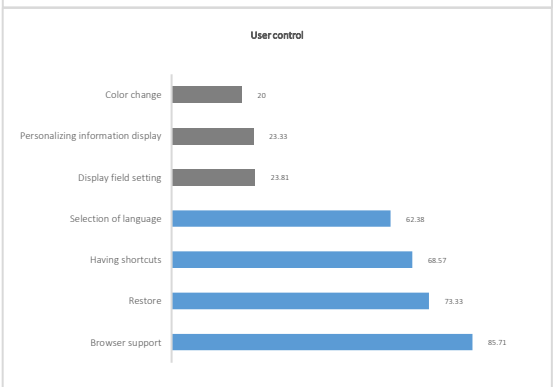
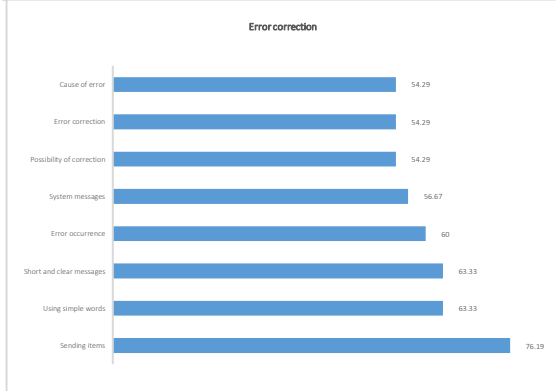
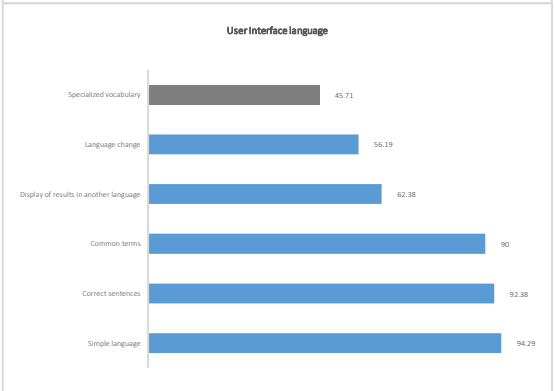
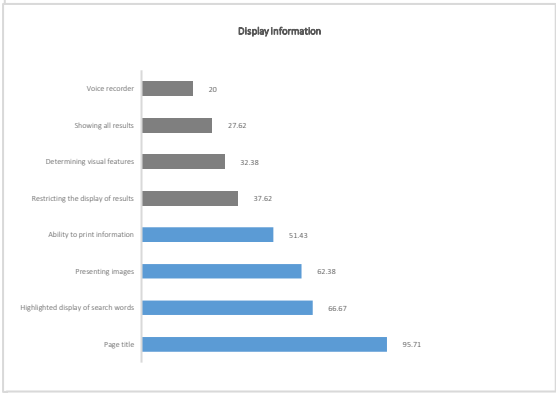
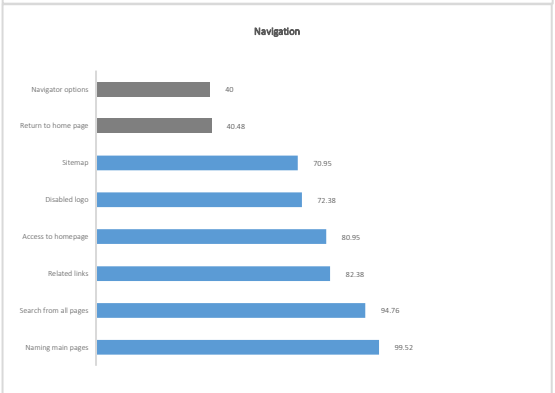
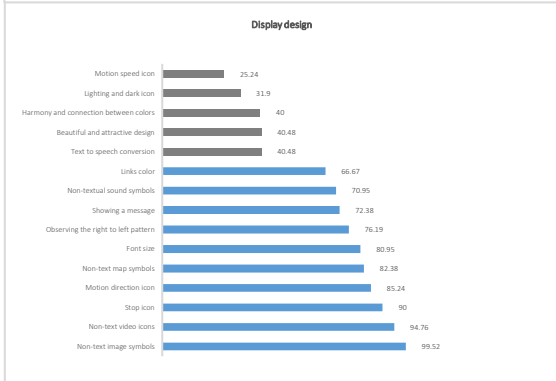
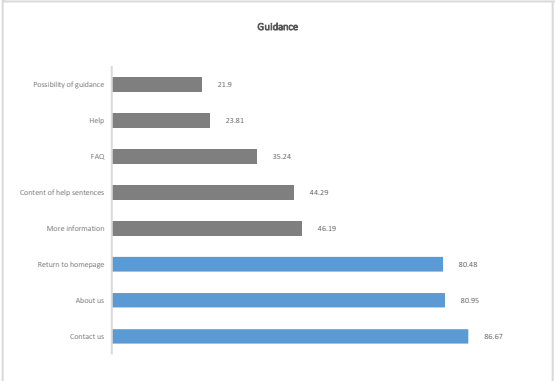
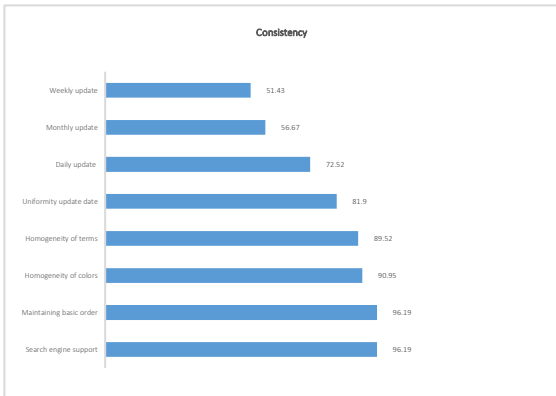
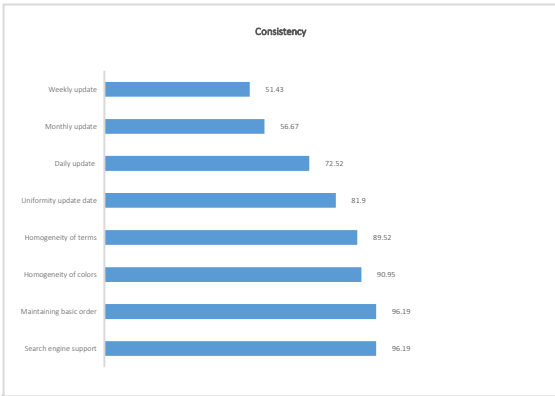


Figure 1. Score of each component separately for each criterion

Discussion

Today, the Internet plays a significant role in the flow of information and awareness of the people, part of which is done by websites(Chand & Ramesha, 2017). However, some groups in society need more attention, such as disabled people because this event temporarily or permanently lurks in everyone(Soltani, Khosravi, et al., 2015). In this study, 10 main criteria in the form of 76 appropriate components were identified and assessed to evaluate the user interfaces of websites for the disabled. Our investigation showed that websites meant for the disabled met an average 62.66% of the criteria, which showed that the user interface was in a favorable condition in most sites. However, some criteria did not function in an acceptable level.

In today's world in which access to information is a vital principle, a strong user interface must be designed to achieve maximum accessibility and usability(Lanyi et al., 2012). A good user interface makes users more satisfied in their surf of websites to use the websites more effectively(Khaleghi, 2006). An appropriate user interface is also a factor significantly affecting the performance of users, especially the speed and accuracy in finding specific information(Blandford et al., 2001; Näsänen et al., 2001). In a study by Chu *et al.* the impact of user interface design on an information system for nurses was investigated and it was stated that a user-friendly interface could increase efficiency and save time. Their results showed that the data input time of each document was reduced from 22.8 to 3.2 seconds, that the data entry steps were decreased from 9 to 3 steps in the new user interface and that the completion of medical records was increased approximately fivefold (Chu et al., 2016). On the other hand, poor user interface design leads to anger, confusion,

misperception, and increasing stress(Large & Tedd, 2001), while people with disabilities potentially suffer from these problems and such situations will worsen the situation.

Our study showed that among the ten criteria, consistency and ease of use obtained the highest scores, which was in agreement with the results of previous studies(Y. Norouzi & Motazhari, 2015). The findings also showed poor performance of the search criterion on the websites. Weakness in search function seems to be a common problem that can be seen in previous studies(M Hassanzadeh & Eskandari, 2013; Mohammad Hassanzadeh & Sohrabzadeh, 2013; Mehrad & Zahedi, 2007). Obviously, it should be noted that if a set is properly designed in terms of user interface or strong content but is not able to search strongly through different operators for efficient application of software content, strong user interface design is practically not useful or attract the users and does not facilitate the use of software(Bharati & Madhusudhan, 2019; M Hassanzadeh & Eskandari, 2013).

Some studies related to our study have notable results. For example, the study by Rahman and Batcha(Rahman & Batcha, 2020) showed that most of the library websites under study have static pages with weak layout and navigation characteristics and rarely being regular updated. They also showed that none of the library websites/web-ages have features for feedbacks, and they also lack in providing FAQ, news-clippings, user manual and single window search. Another study by Vasantha Raju and Harinarayana revealed that only 53.33% of library websites provides, FAQ. Also only 39.99% of the web sites have provision for explicit home link as well as through logos. The study showed that persistent navigation feature is observed only on 50% of the websites(Vasantha-Raju & Harinarayana, 2008). Also, the findings of Battleson *et al.* indicated that websites have problems such as problems with the links “web search” and “Need help” and with terminology, text-heavy presentation, identification of most appropriate choice. Some of

these findings are consistent with our results(Battleson et al., 2001). So, based on these results and the present study, some criteria such as FAQs need more attention. Because frequently asked questions can prevent repetitive questions and answers and save users time.

In our study, review of compliance with the ten criteria on websites of the disabled showed that the website of Irantavana has the highest level of compatibility compared to other websites. This is while the website of Iranian Welfare Organization as a government body enjoying state budget is in the second rank after an NGO (i.e. website of Iranspd). These results seem to indicate that NGOs are paying more attention to user satisfaction. For instance, the study of Tolohzamani *et al.* indicated that private banks have better feedback in attracting customers than ordinary state-owned banks as well as a better performance. (Tolohzamani et al., 2018). Since each criterion in the user interface consists of several components, paying attention to the less considered criteria (black items in Figure 1) can improve the criteria and thus lead to more effective use by users. For example, the option to record audio is a must for people with disabilities. Because people with physical disabilities are unable to do some physical tasks, they can make use of this option to better meet their information needs.

Considering the role of field experts in website design, the most important user interface criteria were ranked, with display design and search being the most important and least important criteria, respectively. The importance of these criteria, except for the search criterion, can be clearly seen in previous studies(Hariri & Norouzi, 2011). It seems that due to the physical limitations of people with disabilities, experts may not have considered the disabled capable of searching, or they may have regarded this criterion more appropriate for information search databases or libraries. However, the role of search in data retrieval should not be overlooked.

Strengths and weaknesses

This study heuristically evaluated the user interface on the websites of people with disabilities for the first time based on our knowledge, which is the strength of this study. However, not consulting the disabled people themselves on the components required in user interface design can be regarded a limitation. Anyway, the present study can be an incentive and complement to studies in the field of user interface for the disabled.

Conclusions

The interface of websites for people with disabilities is associated with problems in some sections. Due to their limitations, people with disabilities need websites that meet the criteria of the user interface to a higher extent in order to be able to communicate with the disabled more effectively. Observing the user interface as the first meeting place of the user with the world of information is essential, which can facilitate the information cycle and prepare the disabled people for a stronger presence in interpersonal communication, social interactions and active participation in society. Therefore, this issue should be taken into account more seriously by the authorities and evaluated periodically. The criteria extracted from this study and the results can be used in the form of a proposed framework to strengthen the user interface on the websites of people with disabilities.

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